

REMARKS

Attached hereto is a Request for an Extension of Time and the appropriate fee.

The Office Action raised an issue under 35 U.S.C. § 112 with regards to Claim 8 which is believed to be mooted by our amendment of Claim 8. Applicants filed a Preliminary Amendment with the Application, and dependent Claims 19-26 do not depend on Claim 8, but rather depend back to Claim 1 now amended. If there are any remaining issues on Claims 9-26, the undersigned attorney would appreciate a telephone conference.

As the Examiner is aware, the art of manufacturing plasma display panels is a field that has been constantly reviewed by highly skilled scientists and engineers due to the commercial interest in providing consumer products of thin display panels of a relatively large size. A major barrier has been the high cost of production and accordingly improvements that reduce this cost and make available these products to the general public while at the same time providing superior luminescence are still goals in this art.

The present invention recognizes the problems of deterioration of blue phosphorous cells and resolves these problems in a novel method of circulating dry gas through spaced peripheral gaps existing between a sandwiched structure of a face panel and a back panel as they are degassed in such a manner to improve the performance of the blue phosphorous cells while sealing the panel as it progresses past a series of nozzles for introducing the dry gas in a global heating environment that not only degasses contaminants from the panel structure but further softens and seals while closing gaps in the sealant layer. The present invention does not require additional processing steps to locally heat selected areas of the sealant layer to create a "bridging gap" of material.

The introduction of a freely circulating dry gas is aided by the provision of a series of protrusions or depressions in the sealant layer forming step to transitorily create the plurality of spaced open gaps along the vertical sides of the pre-form panel sandwich.

Additionally, the decontamination of gases can be simultaneously performed during sealing, and in one embodiment, the application of a temperature profile can optimize both the decontamination and the sealing procedure of the gaps.

The Office Action rejected Claim 27 as being anticipated by the *Inoue et al.* (U.S. Patent No. 6,236,159). The Office Action referred to Figure 3, but there appears to be some confusion in mentioning "*Betsui*". Assuming that the reference is to *Inoue et al.*, Figure 3 discloses providing barrier ribs 29 which create a maze or labyrinth flow pattern between a vent hole 31a in a lower surface of the panels and a vent hole 31b, again in a lower surface of the panel. Presumably vacuum is applied to vent hole 31b while an inert gas is inserted in the vent hole 31a to insure a flow of the inert gas across each of the barriers for removing any contaminant gas. As noted on Column 2, Lines 39-43, the two vent holes are purposely formed in a diagonally opposite relationship in the underlying rear substrate of the panel. Thus, the introduction of a gas through a vent hole in a rear panel surface is of a conventional configuration and does not teach or suggest a gas circulating unit for directing heating gas to sides of the panels so as to circulate the heating gas from the outer regions of the panels to an inner space between the panels.

Reference can be made to Figure 10 of our present invention wherein dry air is directed specifically against the vertical sides of our panels, not through a vent hole in the rear surface as taught by the *Inoue et al.* reference. Additionally, as shown in Figure 10 and Figure 7, our panels can be conveyed on a conveyor belt extending through a heating oven so that a dual function is provided, removing contaminant gases through open gaps in the side of our panels

while sealing the panels together. As can be appreciated, our economical production method is provided while increasing the luminescence of blue phosphorous cells. *Inoue et al.* does not recognize the problems of blue phosphor cells and teaches the forcibly injection of an inert gas through a tube. As noted on page 26, our present invention does not require such apparatus in order to effectively release moisture from an inner space, and can also provide a sealing of the panels without requiring the subsequent closing of the vent holes in the rear panel surface.

Claims 1-17 were rejected over a combination of the *Kamagu et al.* (U.S. Patent No. 5,846,110) when combined with the *Cho et al.* (U.S. Patent No. 6,109,994).

The *Kamagu et al.* reference seeks to address the warping problem that occurs in large size plasma display panels by providing a pair of intentionally bent convex surfaces for the front and back panels. The convex surfaces are created by retaining a stress during their formation and takes into consideration the atmospheric pressure that will be applied against the plasma display panel when it is in operation and the interior of the panel is at a below atmosphere condition. As noted on Column 3, Lines 38-61, the principal teaching in this reference is to insure that stress remains in the front panel substrate and the back panel substrate to assist in an elastic deformation.

The Office Action noted specifically the structure of the front panel as disclosed in Figures 5 and 6. Such disclosure teaches a sealing area a31 that is displaced from the effective display area a1 by a non-display area a2 to avoid the influence of outgassing from any sealants. A vacuum pump is utilized to remove any internal impurity gases only after the sealing process p30. That is, the vacuum pump is utilized in an exhausting stage in step p41 in Figure 5. See Column 8, Lines 10-20.

As can be determined from the respective Figures 7a through 7c, the sealing process where the bending of the respective front panel 10 and back panel 20 is accomplished is the key teaching in this reference. The peripheral sealing layer 31a must be heated at a temperature below the warping temperature in order to retain the desired stress level. There is no specific description about the shape or configuration of the sealant layer 31a, and there is certainly no teaching of leaving a plurality of spaced gaps so that a removal of the contaminating gases can occur by circulating dry air while closing and sealing the panel. *Kanagu et al.* clearly teaches two separate steps with the prime emphasis on a sealing step to maintain a desired stress as noted on Column 3, Lines 58-61 as follows:

"Owning to this remaining stress; the gap between the separator walls and the inner surface of the facing panel is correctly maintained even in an external air pressure lower than the internal pressure of the PDP."

The Office Action recognized that the *Kanagu et al.* reference did not teach the shape of the sealing layer nor any gaps between peripheral regions, and for this reason, cited Figures 6 and 7 of the *Cho et al.* (U.S. Patent No. 6,109,994).

The *Cho et al.* reference, however, would teach away from the features desired in the *Kanagu et al.* reference. The *Cho et al.* reference sought to teach a localized energy application to create a "gap-jumping technique" where a seal is created only in a specific area. The present invention like the *Kanagu et al.* invention, however, provides a global heating of the entire panel during the sealing process and does not require any expensive special equipment for a "gap-jumping technique".

As noted on Column 3, Lines 28-39, the maximum temperature reached during the outgassing and stress relieving operation is much less than that normally reached when sealing is

performed by global heating. As can be appreciated, the *Kanagu et al.* reference further specifically wanted to maintain a desired stress pattern as a residual effect in their finished panels, not remove stress as suggested by *Cho et al.*

In addition, the "gap-jumping technique" basically suggests positioning a sealing area of one body near a matching sealing area of another body at a height of approximately 25  $\mu\text{m}$ . At this point, local energy is provided that can cause material from the two bodies to bridge the gap and partially seal the two bodies together. The mechanism for this gap-jumping is apparently surface tension of a liquid body when it is melted. Thus, the *Cho et al.* reference suggests liquefying, by a local application of heat, the sealant layer, and more specifically, liquefying it so that it will in essence wet the respective substrates and flow to occupy the volume.

*ND PENDING* { The intentional provisions of gaps in the sealing material created by either protrusions or grooves of a specific configuration and size as defined in our present invention is neither recognized nor taught by the *Cho et al.* reference. Additionally, there is no teaching of providing a vertical height to an opening greater than 300  $\mu\text{m}$  which is preferred in our present invention.

It should be noted that the *Cho et al.* reference, like the *Inoue et al.* reference, also teaches providing a getter for the removal of contaminant gases. See Column 10, Lines 31-40.

It is respectfully submitted that the application of a high temperature localized heating such as laser, which requires subsequent stress release procedures, would be contra to the teachings of the *Kanagu et al.* reference which wants to maintain a predetermined stress to warp both the front and back panels.

The *Cho et al.* reference further suggests removing trapped undesirable gases after sealing in a vacuum chamber. See Column 12, Lines 43-55.

Finally, the Office Action cited the *Aoki et al.* (U.S. Patent No. 5,951,350) for the purpose of teaching the depositing of blue phosphor cells. This reference, however, does not cure the deficiencies of the earlier *Kanagu et al.*, *Cho et al.* or *Inoue et al.* references.

Referring to Claim 1 (Amended), our sealant layer is formed to provide a gap between the peripheral regions of the front and back panels and allows dry gas to pass between the inner space and the outside sides of our panels while heated in a dry gas atmosphere. Additionally, our sealing step not only permits a decontamination, but also seals the sealant layer and removes the gaps in one process. Further, the sealing layer is formed with a plurality of protrusions or depressions to provide gaps, and the vertical height of such an opening is 300  $\mu\text{m}$  or greater. This teaches away from the *Cho et al.* structure melting and wetting surfaces, and the *Cho et al.* structure does not teach sealing with a global heating of the entire front and back panel as provided in our Claim 1.

Our dependent claims further define the sealant layer as being either narrower than the remaining portions of the sealant layer when it is a protrusion or wider when it is a depression in order to accommodate the global heating and the sealing while contaminating gases are being released through the circulation of dry air.

Our dependent claims also define a temperature differential or profile between a sealing step and the softening step which further assists in the removal of contaminating gases such as set forth in dependent Claim 12. Our dry gas can be dry air and preferably has a partial pressure of steam of 130 Pa or lower.

As a result of the unique process steps set forth in our claims, the blue phosphorous cells will be provided with the desired characteristics set forth in the dependent Claim 20-25.

The Office Action contended that a combination of the *Kanagu et al.*, *Cho et al.* and *Aoki et al.* references would render obvious the subject matter set forth in Claims 18-26. Simply providing a blue phosphorous layer as taught by *Aoki et al.* in either the structure of the *Cho et al.* or the *Kanagu et al.* reference would not increase the luminescence intensity and prolong the lifetime of the display panel in a manner defined in these dependent claims. These advantageous features are more than adequately set forth and disclosed in the Tables of our specification, and there is no such teaching in any of the cited references alone or in combination that would render obvious these features.

The new Claims 28 to 30 set forth not only the advantageous formation of the spaced open gaps in a pre-form of the front and back panels that accommodates the circulation of a dry gas, but further provides a resultant improvement in the performance of the blue phosphor layer as the dry gas removes contaminants while the peripheral region is gradually sealed to provide the final form of the plasma display panel. Thus, the manufacturing method of the present invention not only simplifies the steps required in forming the display panel, but further contributes to an improved chromaticity.

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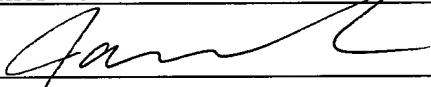
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In light of the amendments to the claims and the above comments, it is believed that the case is now in condition for allowance, and an early notification of the same is requested. If the Examiner believes that a telephone interview will help further the prosecution of this case, he is respectfully requested to contact the undersigned attorney at the listed telephone number.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on July 2, 2003.

By: James Lee

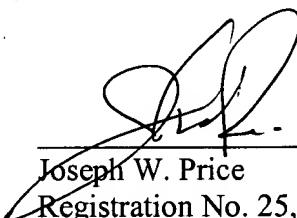


Signature

Dated: July 2, 2003

Very truly yours,

**SNELL & WILMER L.L.P.**



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